

Table A-1
Sediment Ecological Risk Based Thresholds

Portland Harbor Superfund Site
Portland, Oregon

COCs	Target Risk Level	Units	Tissue Residual Assessment											
			Benthic					Invertavore		Omnivore	Piscivore		Detrivore	
			Clams	Crayfish	Worms	LRM	PEC	Sculpin	Peamouth	Largescale Sucker	Northern Pikeminnow	Smallmouth Bass	Pacific Lamprey	
Persistent														
Total PCBs	HQ=1	ug/kg	2420	1370	1470	2670	676	272	--	--	--	64	--	
Dioxin/Furan (2,3,7,8-TCDD Eq)	HQ=1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	
Hydrocarbons														
Total PAH	HQ=1	mg/kg	--	--	--	--	561	--	--	--	--	--	--	
Total LPAH	HQ=1	mg/kg	--	--	--	--	1.5	--	--	--	--	--	--	
Total HPAH	HQ=1	mg/kg - %fines	--	--	--	150	--	--	--	--	--	--	--	
TPH (C10 to C12 aliphatic/aromatic)	HQ=1	mg/kg	--	--	--	11	12	--	--	--	--	--	--	
Pesticides														
Aldrin	HQ=1	ug/kg	--	--	--	--	40	--	--	--	--	--	--	
Dieldrin	HQ=1	ug/kg	--	--	--	--	62	--	--	--	--	--	--	
Total DDx	HQ=1	ug/kg	578	2450	--	1400	63	760	--	--	--	--	--	
gamma-HCH (Lindane)	HQ=1	ug/kg	--	--	--	--	5	--	--	--	--	--	--	
Total Chlordanes	HQ=1	ug/kg	--	--	--	--	18	--	--	--	--	--	--	
Metals														
Cadmium	HQ=1	mg/kg	--	--	--	--	5	--	--	--	--	--	--	
Chromium	HQ=1	mg/kg	--	--	--	--	111	--	--	--	--	--	--	
Copper	HQ=1	mg/kg	--	--	--	444	150	--	--	--	--	--	--	
Lead	HQ=1	mg/kg	--	--	--	196	128	--	--	--	--	--	--	
Mercury	HQ=1	mg/kg	--	--	--	--	1.1	--	--	--	--	--	--	
Zinc	HQ=1	mg/kg	--	--	--	--	46	--	--	--	--	--	--	
Phthalates														
BEHP	HQ=1	ug/kg	--	--	--	--	--	400	--	--	--	135	--	
Butyltins														
TBT	HQ=1	mg/kg	--	--	24	3.1	--	--	--	--	--	--	--	
Toxicity														
Benthic Toxicity	HQ=1		See Narrative Requirement					--	--	--	--	--	--	--

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COCs	Target Risk Level	Units	Bird Egg Assessment		Bird Dietary Assessment					
			Piscivore		Piscivore		Omnivore		Sediment Probing Invertivore	
			Osprey	Bald Eagle	Osprey	Bald Eagle	Hooded Merganser	Belted Kingfisher	Spotted Sandpiper	
			population	population	carp brown bullhead largescale sucker northern pikeminnow smallmouth bass	carp largescale sucker northern pikeminnow peamouth	clams worms peamouth sculpin		clams	worms
Persistent										
Total PCBs	HQ=1	ug/kg	86	86	423	730	618	51	996	606
Dioxin/Furan (2,3,7,8-TCDD Eq)	HQ=1	ug/kg	0.0034	0.0034	--	--	--	--	--	0.0541
Hydrocarbons										
Total PAH	HQ=1	mg/kg	--	--	--	--	--	--	--	--
Total LPAH	HQ=1	mg/kg	--	--	--	--	--	--	--	--
Total HPAH	HQ=1	mg/kg - %fines	--	--	--	--	--	--	--	--
TPH (C10 to C12 aliphatic/aromatic)	HQ=1	mg/kg	--	--	--	--	--	--	--	--
Pesticides										
Aldrin	HQ=1	ug/kg	--	--	--	--	--	--	--	--
Dieldrin	HQ=1	ug/kg	--	--	--	--	--	--	--	--
Total DDX	HQ=1	ug/kg	--	--	--	--	--	--	--	--
gamma-HCH (Lindane)	HQ=1	ug/kg	--	--	--	--	--	--	--	--
Total Chlordanes	HQ=1	ug/kg	--	--	--	--	--	--	--	--
Metals										
Cadmium	HQ=1	mg/kg	--	--	--	--	--	--	--	--
Chromium	HQ=1	mg/kg	--	--	--	--	--	--	--	--
Copper	HQ=1	mg/kg	--	--	--	--	--	--	--	--
Lead	HQ=1	mg/kg	--	--	--	--	--	--	--	--
Mercury	HQ=1	mg/kg	--	--	--	--	--	--	--	--
Zinc	HQ=1	mg/kg	--	--	--	--	--	--	--	--
Phthalates										
BEHP	HQ=1	ug/kg	--	--	--	--	--	--	--	--
Butyltins										
TBT	HQ=1	mg/kg	--	--	--	--	--	--	--	--
Toxicity										
Benthic Toxicity	HQ=1		--	--	--	--	--	--	--	--

Notes:
COC = contaminant of concern
PCB = polychlorinated biphenyl
PAH = polycyclic aromatic hydrocarbon

LPAH = low molecular weight PAH
HPAH = high molecular weight PAH
TPH = total petroleum hydrocarbons
BEHP = bis(2-ethylhexyl)phthalate
TBT = tributyltin

HQ = hazard quotient
mg/kg = milligram per kilogram
ug/kg = microgram per kilogram
RBT = risk based threshold

RAO = remedial action objective
-- = no value

Table A-1
Sediment Ecological Risk Based Thresholds

Portland Harbor Superfund Site
Portland, Oregon

COCs	Target Risk Level	Units	Mammal Dietary Assessment		RBTs	
			Aquatic-Dependent Carnivore		RAO 5	RAO 6
			Mink	River Otter		
			carp crayfish sculpin smallmouth bass	clams carp crayfish sculpin smallmouth bass		
Persistent						
Total PCBs	HQ=1	ug/kg	31	68	64	31
Dioxin/Furan (2,3,7,8-TCDD Eq)	HQ=1	ug/kg	0.056	0.171	--	0.0034
Hydrocarbons						
Total PAH	HQ=1	mg/kg	--	--	561	--
Total LPAH	HQ=1	mg/kg	--	--	1.5	--
Total HPAH	HQ=1	mg/kg - %fines	--	--	150	--
TPH (C10 to C12 aliphatic/aromatic)	HQ=1	mg/kg	--	--	11	--
Pesticides						
Aldrin	HQ=1	ug/kg	--	--	40	--
Dieldrin	HQ=1	ug/kg	--	--	62	--
Total DDx	HQ=1	ug/kg	--	--	63	--
gamma-HCH (Lindane)	HQ=1	ug/kg	--	--	5	--
Total Chlordanes	HQ=1	ug/kg	--	--	18	--
Metals						
Cadmium	HQ=1	mg/kg	--	--	5	--
Chromium	HQ=1	mg/kg	--	--	111	--
Copper	HQ=1	mg/kg	--	--	150	--
Lead	HQ=1	mg/kg	--	--	128	--
Mercury	HQ=1	mg/kg	--	--	--	--
Zinc	HQ=1	mg/kg	--	--	46	--
Phthalates						
BEHP	HQ=1	ug/kg	--	--	135	--
Butyltins						
TBT	HQ=1	mg/kg	--	--	3.1	--
Toxicity						
Benthic Toxicity	HQ=1		--	--	<i>Chironomus dilutus</i> 10-day survival: survival > 84%	

Benthic Toxicity Narrative Requirement:

Chironomus dilutus 10-day biomass: biomass > 82% of the laboratory negative control biomass

Hyalella azteca 28-day survival: survival > 79%

Hyalella azteca 28-day biomass: biomass > 66% of the laboratory negative control biomass

In addition to having survival or biomass values lower than the above PRG percentages, each individual sample with survival or biomass lower than its respective PRGs must have survival or biomass statistically significantly lower than that of the laboratory negative control sediment response, as determined using either a one-tailed parametric t-test, or a one-tailed non-parametric Mann-Whitney U test (sometimes referred to as the Wilcoxon rank sum test or WRS test, either name is fine), with a statistical significance level of $p < 0.05$. Survival/biomass and statistical significance tests must both fail before an individual sample is considered to have exceeded a toxicity based PRG.

Table A-2
Surface Water Ecological Risk Based Thresholds

Portland Harbor Superfund Site
Portland, Oregon

Surface Water COCs	Units	TRVs from BERA	RAO 6 RBTs	RAO 7 RBTs
Total PCBs	ug/L	0.19	--	0.19
Dioxin/Furan (2,3,7,8 TCDD Eq)	ug/L	--	--	--
Total PAHs	ug/L	--	--	--
Total LPAHs (Naphthalene)	ug/L	12	--	12
Total HPAHs (Benzo(a)pyrene)	ug/L	0.014	--	0.014
Aldrin	ug/L	--	--	--
Dieldrin	ug/L	--	--	--
Total DDx	ug/L	0.011	--	0.011
gamma-HCH (Lindane)	ug/L	--	--	--
Total Chlordanes	ug/L	--	--	--
2,4-Dichlorophenoxy Acetic Acid (2,4-D)	ug/L	--	--	--
2,4,5-Trichlorophenoxypropionic acid (2,4,5-TP) (Silvex)	ug/L	--	--	--
Arsenic (dissolved)	ug/L	--	--	--
Cadmium (dissolved)	ug/L	0.09	--	0.09
Chromium VI (dissolved)	ug/L	--	--	--
Copper	ug/L	2.74	--	2.74
Lead (dissolved)	ug/L	0.54	--	0.54
Mercury	ug/L	--	--	--
Zinc (dissolved)	ug/L	36.5	--	36.5
Bis(2-ethylhexyl)phthalate	ug/L	3	--	3
Tributyltin Ion	ug/L	--	--	--
1,2-Dichlorobenzene	ug/L	14	--	14
Hexachlorobenzene	ug/L	--	--	--
Pentachlorophenol	ug/L	--	--	--
Chlorobenzene	ug/L	64	--	64
Chloroform	ug/L	28	--	28
Ethylbenzene	ug/L	7.3	--	7.3
Tetrachloroethylene (PCE)	ug/L	--	--	--
Trichloroethylene (TCE)	ug/L	47	--	47
Vinyl Chloride	ug/L	--	--	--
Cyanide	ug/L	5.2	--	5.2

Notes:

BERA = baseline ecological risk assessment

TRV: toxicity reference value

COC = contaminant of concern

ug/L = microgram per liter

RBT = risk based threshold

RAO = remedial action objective

-- = no value

Table A-3
Transition Zone Water Ecological Risk Based Thresholds

Portland Harbor Superfund Site
Portland, Oregon

Pore Water COCs	Units	TRVs from BERA	RAO 8 RBTs
Total PCBs	ug/L	---	---
Dioxin/Furan (2,3,7,8 TCDD Eq)	ug/L	---	---
Total PAHs	ug/L	---	---
Total LPAHs (Naphthalene)	ug/L	12	12
Total HPAHs (Benzo(a)pyrene)	ug/L	0.014	0.014
TPH (C-10 to C-12)	ug/L	2.6	2.6
Total DDx	ug/L	0.011	0.011
gamma-HCH (Lindane)	ug/L	---	---
Total Chlordanes	ug/L	---	---
2,4-Dichlorophenoxy Acetic Acid (2,4-D)	ug/L	---	---
2,4,5-Trichlorophenoxypropionic acid (2,4,5-TP) (Silvex)	ug/L	---	---
Arsenic	ug/L	---	---
Chromium	ug/L	---	---
Lead	ug/L	0.54	0.54
Manganese	ug/L	120	120
Mercury	ug/L	---	---
Vanadium	ug/L	20	20
Zinc	ug/L	36.5	36.5
1,2-Dichlorobenzene	ug/L	14	14
Hexachlorobenzene	ug/L	---	---
Pentachlorophenol	ug/L	---	---
Benzene	ug/L	130	130
Chlorobenzene	ug/L	64	64
Chloroform	ug/L	28	28
1,1-Dichloroethene	ug/L	25	25
cis-1,2-Dichloroethene	ug/L	590	590
trans-1,2-Dichloroethene	ug/L	---	---
Ethylbenzene	ug/L	7.3	7.3
Tetrachloroethylene (PCE)	ug/L	---	---
Trichloroethylene (TCE)	ug/L	47	47
Toluene	ug/L	9.8	9.8
1,1,1-Trichloroethane	ug/L	---	---
Vinyl Chloride	ug/L	---	---
o-Xylene	ug/L	13	13
m- and p-Xylene	ug/L	67	67
Total Xylenes	ug/L	13	13
Cyanide	ug/L	5.2	5.2
Perchlorate	ug/L	9300	9300

Notes:

BERA = baseline ecological risk assessment

TRV: toxicity reference value

COC = contaminant of concern

ug/L = microgram per liter

RBT = risk based threshold

RAO = remedial action objective

-- = no value